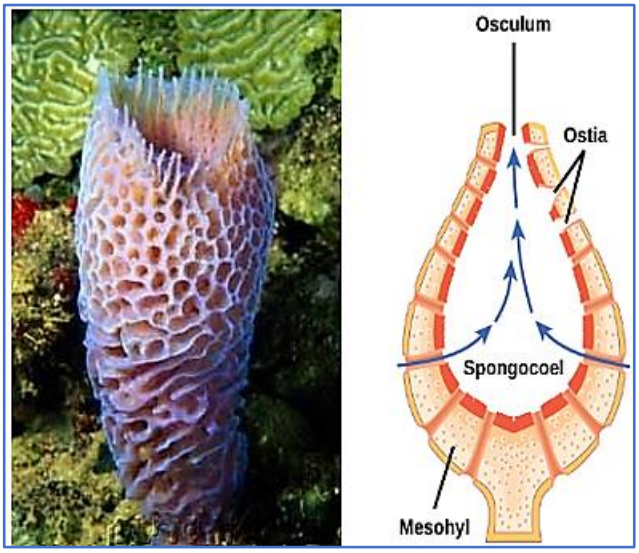
# Phylum Porifera (Sponges)

## Characteristics of Sponges

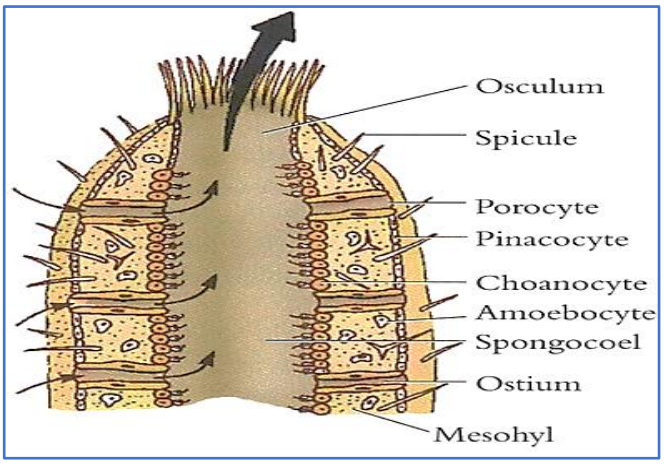
Porifera is the only phylum of the **Parazoa** (metazoan without tissue grade) in the Kingdom Animalia. Sponges are mostly marine inhabitants, but few are fresh water which are found wherever there are rocks, shells, or coral to provide a suitable substratum. Body wall encloses large cavity called **spongocoel**. Water enters spongocoel through numerous pores called **ostia**, and leaves spongocoel through large aperture called **osculum**. Body wall consists of jelly-like substance called **mesohyl** that is sandwiched between two thin layers of cells.




## Body wall structure

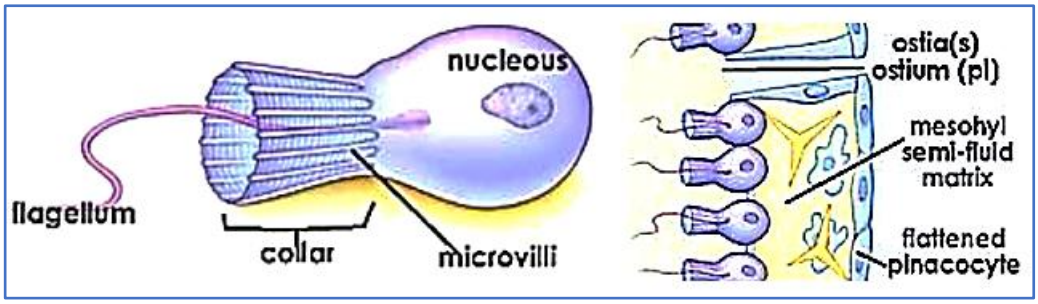
The body of sponge consists of two cellular layers (outer & inner) and between them there is a jelly-like layer (mesohyl):

1. **The outer layer:**
   This layer called **epidermis** and consists of two types of cells:
   a. **Pinacocytes:** They are plate-like cells that cover the exterior and some interior surfaces, and responsible for anchoring the base of sponge on suitable surface. Also, they digest food particles that are too large to enter from ostia.
   b. **Porocytes:** They are tube-like cells that form valves around ostia to control the flow of water through the sponge by changing the size of the openings of the ostia.




## 2. The inner layer

It is made of vase - shaped cells called **choanocytes** which have a **collar** of fine fibrils connected by microvilli to trap food particles by phagocytosis. Also, these cells contain a single **flagellum** that is used to propel water through the pores into a central cavity. Choanocyte can convert into **sperm** for sexual reproduction.




## 3. Mesohyl

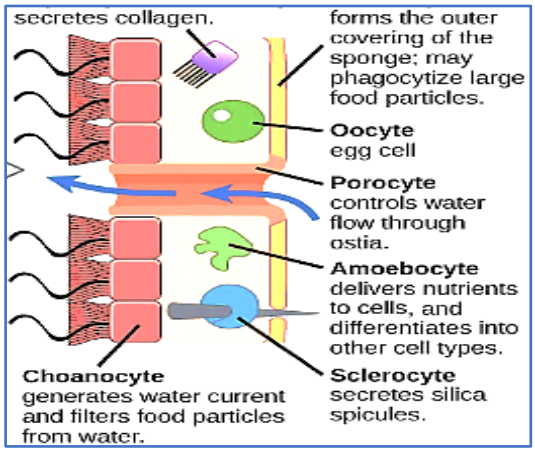
It is a semi-fluid matrix consists of cells called **Archaeocytes** and supported by the skeletal elements. These cells can change into other cells to perform several functions in sponge:

**a)** They convert into **amoebocytes:** They have pseudopodia to pick up food particles from choanocytes, digest it, then carry nutrients, oxygen to other cells of sponge, and eliminate waste products.

**b)** They convert into **Oocytes** (ovum) for sexual reproduction.

**c)** They maintain the skeleton of sponge via converting into: **Spongioblast** (secrete spongin fibers); **Scleroblast** (secrete spicules); **Collencyte** (secrete collagen fibrils).

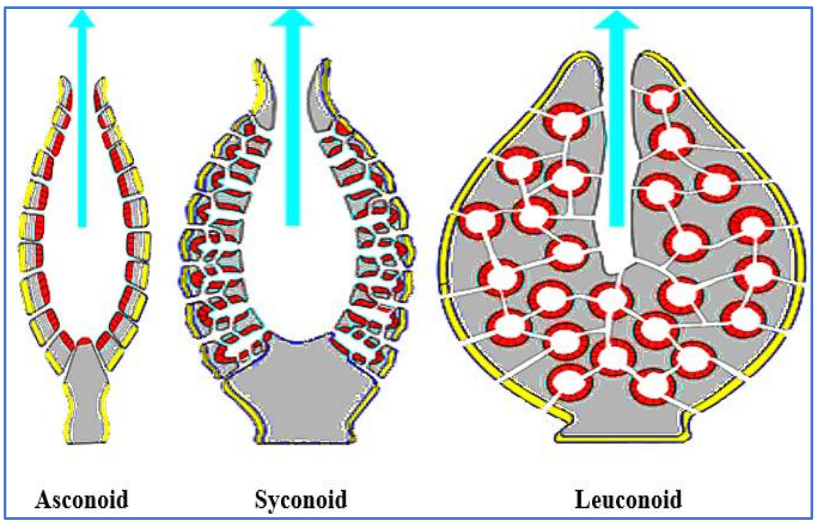
**d)** They are the basis of some asexual reproduction during unfavorable condition by forming **gemmules**.




## Shapes of Sponges

By beating their flagellum, Choanocytes keep the water flowing through canal system in the correct direction, water enters ostia to spongocoel and leaves through osculum. There are three types of canal system in sponges that result in different shapes:

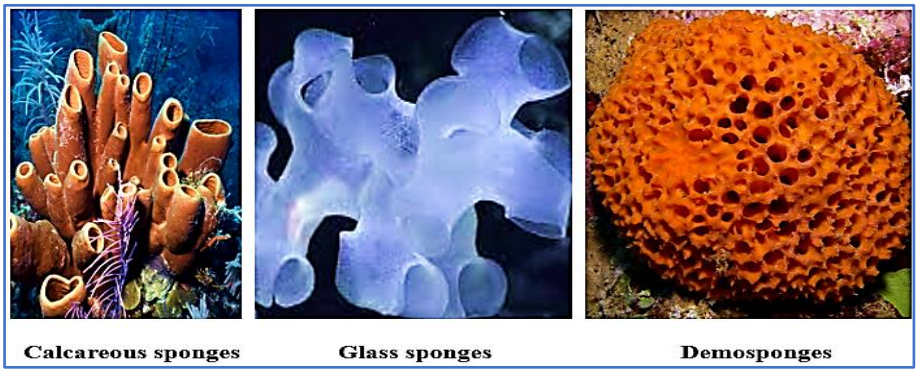
1. **Asconoid sponges:** They are the simplest shape of sponges, in which canals run straight from ostia to spongocoel. These sponges live in groups and have thin body wall (1 mm).
2. **Syconoid sponges:** They have branching canals, so water not flow straight from ostia to spongocoel and body wall is pleated & become thicker (few cm). They do not live in groups.
3. **Leuconoid sponges:** They have the most complicated shape of sponges because canals are longer, more branched, and lead to chambers. Therefore, these sponges have thick body wall (over 1 m), and there is no real spongocoel just a central exit leading to osculum. They live in large groups each sponge having its own osculum



## Classification of Sponges

Sponges are classified into three classes according to the composition of their body skeleton (spicules & spongin fibers):

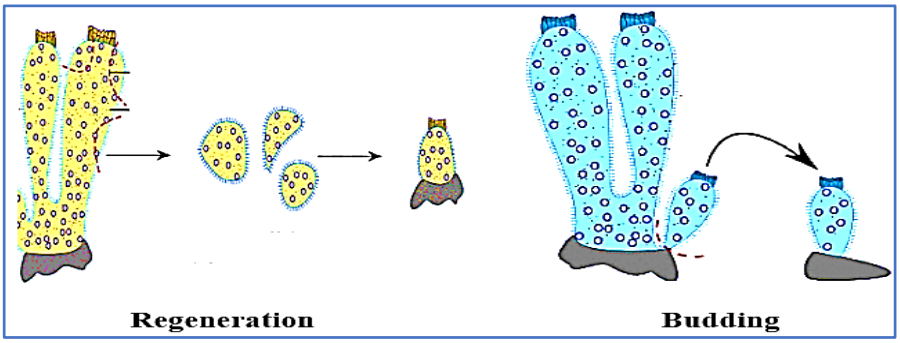
1. **Calcarea (calcareous sponges):** They have spicules of calcium carbonate, without spongin fibers. They found as asconoid, syconoid, or leuconoid.
2. **Hexactinellida (glass sponges):** They have spicules made of silicate salts, without spongin fibers. They found in leuconoid shape only.
3. **Demospongiae (demosponges):** They have spicules made of silicate salts joined by meshwork of spongin fibers. They found as leuconoid shape only.




## Reproduction of Sponges

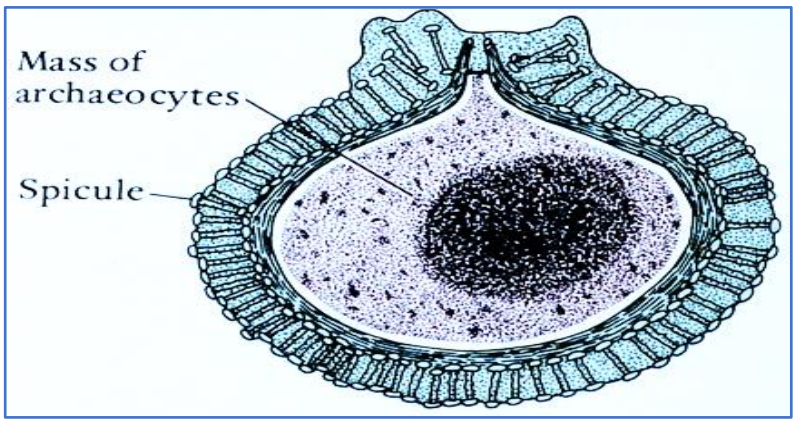
### A. Asexual Reproduction:

1. **Regeneration:** Pieces of sponge are able to regenerate into whole new sponges.
2. **Budding:** The buds may remain attached to the parent or separate from it, and each bud develops into a new individual.




3. **Gemmule:** Sponges can withstand adverse conditions (drying or cold) by forming resistant structures called **gemmules** (aggregates of sponge archeocytes and food, covered by a hard coating containing spicules or spongin fibers) that later develop into new individuals. When a gemmule

germinates, the archeocytes transform into other cell types needed to make a functioning sponge.




## B. Sexual Reproduction:

Most sponges are **hermaphrodites** (the same individual function as both sexes, producing eggs and sperm). Sperms are produced by choanocyte, while eggs are formed by transformation of archeocytes. The fertilized egg either released into the water or retain until they hatch into a swimming larva. The larva is flagellated and swim freely for a short time and attaching to a suitable substrate and develop into young sponges.